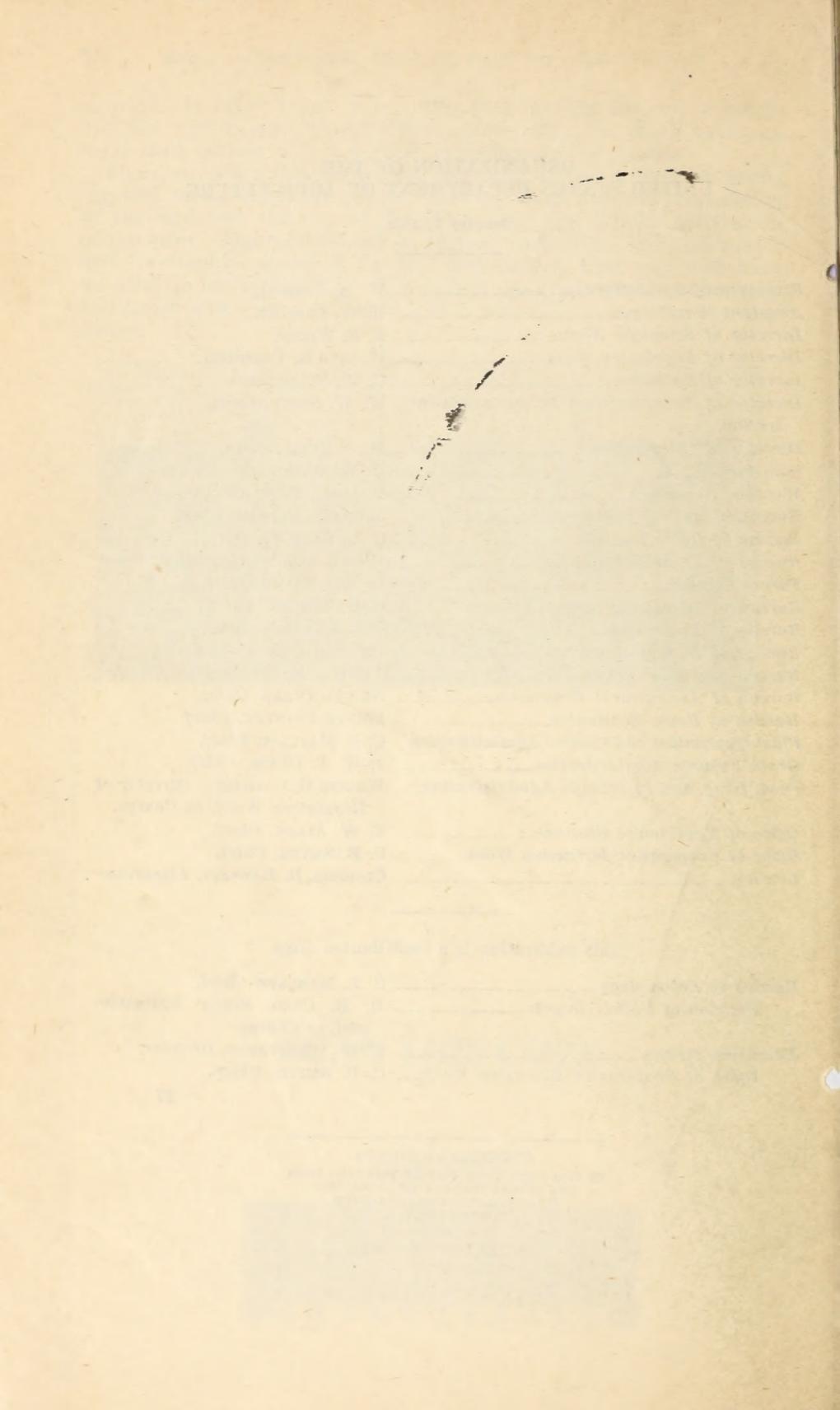


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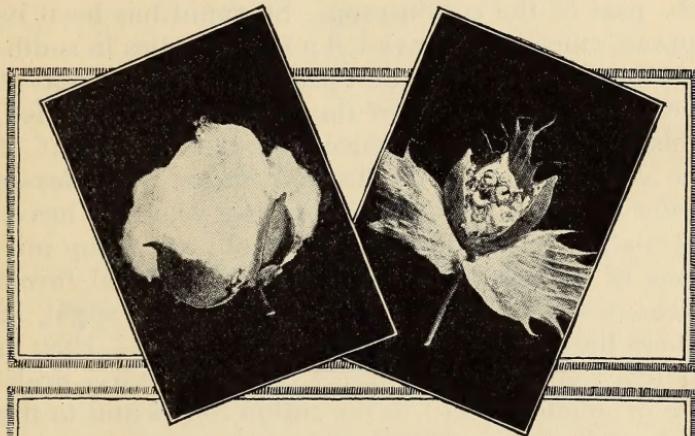
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U. S. DEPARTMENT of AGRICULTURE
MISCELLANEOUS PUBLICATION No. 35

WASHINGTON, D. C.

REVISED 1930
JANUARY, 1929



COTTON
OR
WEEVILS



UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
1930

COTTON DIVISION COPY

THE cotton-boll weevil is the most destructive pest of the cotton crop. So rapid has been its spread, since it first invaded a few counties in southern Texas about 1892, that practically 90 per cent of the entire Cotton Belt of the South is now infested. This infested area produces about 90 per cent of the cotton crop of the United States. The losses suffered by cotton farmers during years of heavy infestation by the boll weevil amount to many millions of dollars. The damage on individual farms varies widely. Some years injury is only slight, in others the cotton crop is seriously reduced. How to control weevil damage effectively has been a problem of much concern to the cotton States and to the Federal Government for many years.

This publication tells the important facts about the weevil; what it looks like, how it lives, how it grows, the damage it does, and the different ways of controlling it commonly used. Written in simple language, it is intended especially for boys and girls, although it should be useful also to grown-ups who want to learn about the weevil and how to fight it. Teachers, club leaders, and extension workers also should find this publication of value in teaching the necessary facts about boll-weevil control.

Washington, D. C.

Issued January, 1929; revised, July, 1930

COTTON OR WEEVILS

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No doubt you know that the many different creatures living upon the earth eat many different kinds of food. A man eats several kinds of meat and a great many more kinds of vegetables. The meat he eats comes, of course, from the body of some animal, and the vegetables grow in the soil.

Our cattle, and wild animals of the same kind, such as the buffalo and the deer, live entirely upon plants. On the other hand, such fierce and dreaded animals as the lion and tiger live only on the flesh of other animals. These other animals, however, feed mostly on plants. Thus we see that the vegetable kingdom really provides the food for the animal kingdom.

Not all plants are equally good as food for man. In fact, the vast majority of plants grown in the different parts of the world he will not touch as food. Plant-eating animals are much like man in this way; they do not eat all the different kinds of plants, but pick or choose those they like best. Some animals that are heavy plant feeders have a very large variety of plants from which they can get their food, while others eat only a few plants and so must carefully select what they are to eat.

When we come to the lower classes of animals—the insects, for instance—we find that some of them can eat only one or two kinds of plants. They would starve to death if they could not get the special plant that they can eat.

The cotton-boll weevil is one of these insects. It has only two or three plants on which it can feed, and cotton is one of them—in fact, the one it likes best. The young of this weevil are never known to feed upon any plant except the cotton, although the grown-up insect will, under some circumstances, eat other plants that are close relatives of the cotton.

¹ ACKNOWLEDGMENT: The authors have consulted freely the following publications: HUNTER, W. D., and PIERCE, W. D. THE MEXICAN COTTON-BOLL WEEVIL: A SUMMARY OF THE INVESTIGATION OF THIS INSECT UP TO DECEMBER 31, 1911. U. S. Congress, 62d, 2d sess., Senate Doc. 305, 188 p., illus. 1912. (U. S. Dept. Agr., Bur. Ent. Bul. 114.) HUNTER, W. D., and COAD, B. R. THE BOLL-WEEVIL PROBLEM. U. S. Dept. Agr. Farmers' Bul. 1329, 30 p., illus. 1923.

The fact that this weevil feeds almost entirely on cotton is very important to us. When a particular kind of insect eats only one kind of plant, it must have a great deal more of that plant each day for its food than it would need if it could eat several different kinds of plants. Then, too, insects increase very fast and eat so much of their food plant that there is sometimes not enough left for us to use. This is true of the cotton-boll weevil. Each year there are millions of these weevils and they get hungry every day. If there is no way to destroy them in our cotton fields, they will eat so much of the crop that there will not be enough left for the cotton planters.

THE COTTON-BOLL WEEVIL

The cotton-boll weevil (fig. 1; fig. 3, C) is a small grayish or brownish, hard-shelled beetle—perhaps you would call it a “bug”—with six legs and a long nose or snout. You probably have seen some of these weevils in your father’s cotton patch and perhaps you have picked them off the growing plants. If you will get one and look at it closely, you will find a great many interesting things about the little animal.

In the first place, the weevil is only about one-fourth of an inch long and one-twelfth of an inch broad. Really it is a very small animal to cause us so much trouble. If you look carefully through a magnifying glass you will find that its mouth is at the end of its snout and has a double pair of jaws for biting and chewing. This little weevil can either walk or fly, just as it chooses.

In the winter the boll weevil sleeps like a bear, but it doesn’t always have such a well-sheltered place as the bear’s den in which to make its bed. In the fall, when the weather turns chilly and the nights are frosty, the weevils which are alive at that time look for shelter of some kind in which to take their long winter nap. Some of them will creep under dead grass or fallen leaves while others will fly to the Spanish moss that hangs from the tree branches in long gray streamers in some parts of the Cotton Belt. This moss (fig. 2) is a favorite sleeping place, although it would not seem to offer much protection in winter.

A great many weevils never wake from their sleep but are killed by the cold of winter. It has been found, by men who have kept cotton-boll weevils in large outdoor wire-screen cages over winter, that in ordinary years only about six or seven out of a hundred ever wake up in the spring. When weevils are kept in cages like this for study, they are given just the kind of sleeping quarters they would themselves choose and the cages are kept in the same weather that the insects would have to stand if they were in their natural homes. When the winters are extremely cold, very few weevils will live, but if the winter is unusually warm, then more will live through.

In early spring the weevils begin to wake up, but they do not all wake up at the same time. Some are early risers while others are late sleepers. Some of them wake up in March while others appear in April and May, and some stragglers do not come to life even until June. If the newly awakened weevils find cotton growing

they do not lose much time in taking a meal. But if it is too early for cotton, okra, or hollyhocks to be growing, they simply go without food until some of these plants appear above the ground. It is a strange thing that at this time of the year active boll weevils can live without food for several days.

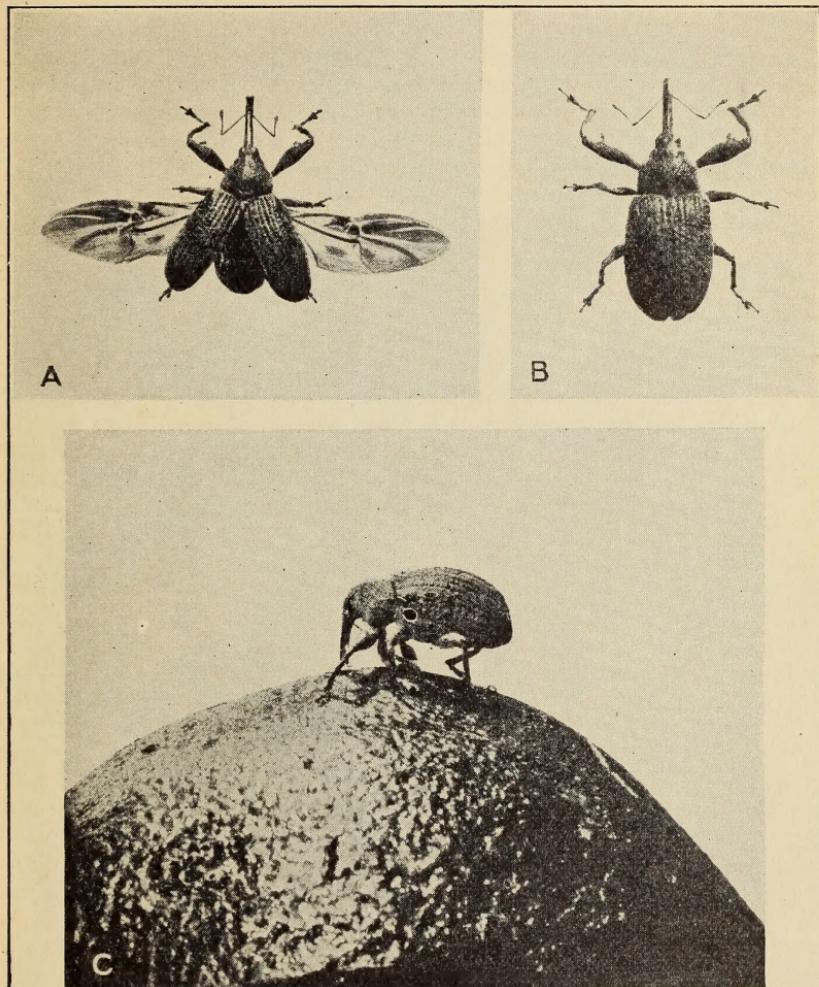


FIG. 1.—The "grown-up" cotton-boll weevil can either walk or fly, as it chooses. A weevil with wings spread, as in flight, is shown at A. At B is a weevil as seen from above, with legs spread out. At C is a weevil feeding on a cotton boll, as seen from the side. All are about four times natural size

The parts of the cotton plant which boll weevils like best as food are the flower buds, or "squares" as the cotton planter calls them. But before the flower buds come the weevils eat the growing tips of the cotton plants and appear to like that food.

HOW A WEEVIL GROWS

The female weevil uses the flower buds of the cotton plant as a place to lay her eggs. She first eats a tiny hole in the bud and

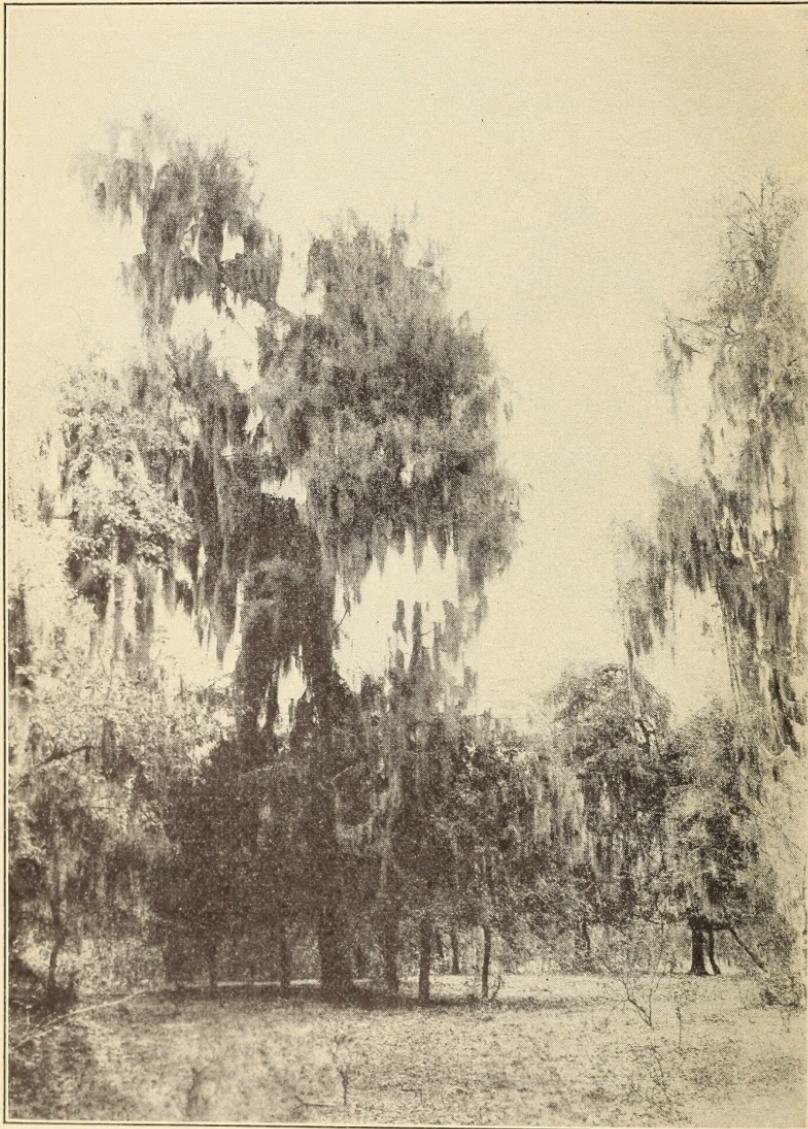


FIG. 2.—In the fall, when the weather turns chilly and the nights are frosty, the boll weevils look for shelter of some kind in which to take their long winter nap. Spanish moss hanging from trees is a favorite wintering place for the weevils

then puts a very small pearly white egg in it. This egg she pushes deep down in the hole and leaves there. In a short time the juices of the plant harden around the egg and completely seal it up within the flower bud. About three days later the egg hatches and a tiny,

white, footless grub appears. This grub looks very much like a small worm and all it can do is eat and grow.

Owing to the care taken by the mother weevil in placing the egg within the bud, the little grub finds itself actually touching the very kind of tender, juicy food that it needs. After eating away for from 7 to 12 days, the grub, or larva as the scientist calls it, becomes full grown (fig. 3, A) and changes into another stage called the pupa (fig. 3, B). This time in the life of the weevil is like the well-known chrysalis stage of the butterfly.

In the meantime all the inside part of the flower bud has been eaten. Needless to say, it will never bloom for it is entirely dead. Frequently these eaten flower buds drop off the plant and fall to the ground. Even before the flower buds drop they look very different from healthy buds. They become whitish and the three outer

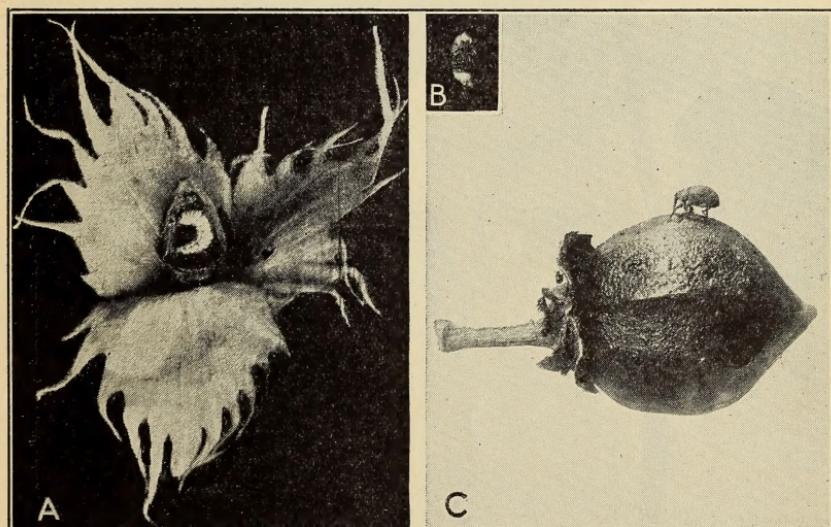


FIG. 3.—The pearly white egg which the mother weevil puts into a tiny hole in the flower bud hatches into a grub. This grub eats and grows for from 7 to 12 days. It then changes to a pupa. From three to five days later the little creature sheds its skin. It has now become a full-grown or "adult" weevil, like its mother. By using its tiny jaws it soon cuts a hole in the flower bud and crawls out. The weevil grub is shown at A, the pupa at B, and the adult weevil, feeding on a cotton boll, at C. All are natural size.

leaves or bracts open out or flare. In a healthy bud these bracts are pressed together. Figure 4 shows this difference between healthy buds and a flared bud.

After the pupal stage of the weevil has lasted from three to five days another change takes place; the little creature sheds its skin and wriggles clear of it in the exact form of the parent weevil that laid the egg. The egg has now become a full-grown or adult weevil, and it is time to leave its childhood home. It is still inside the walls of the flower bud, but by using its tiny jaws it soon cuts a hole the size of its body and crawls through it to the outside world.

When the little bug first comes out of the cotton square its body is soft and orange colored. After it has found food and lived in the open air for a few days the shell of its body hardens and turns a darker shade. In about five days from the time of leaving the

flower bud the weevil, if a female, begins to lay eggs. This we call the beginning of another generation. It usually takes from two to three weeks, depending on the weather, for a generation to develop through the different stages of egg, larva, and pupa, to the adult form. There are several generations each year, made up of males and females in about equal numbers.

THE DAMAGE A WEEVIL DOES

The female weevil seems to like to lay her eggs in the flower bud of the cotton plant. She likes the bud much better than she does any other part of the plant. Sometimes there are not enough flower buds for all the eggs and then the female has to hunt some other

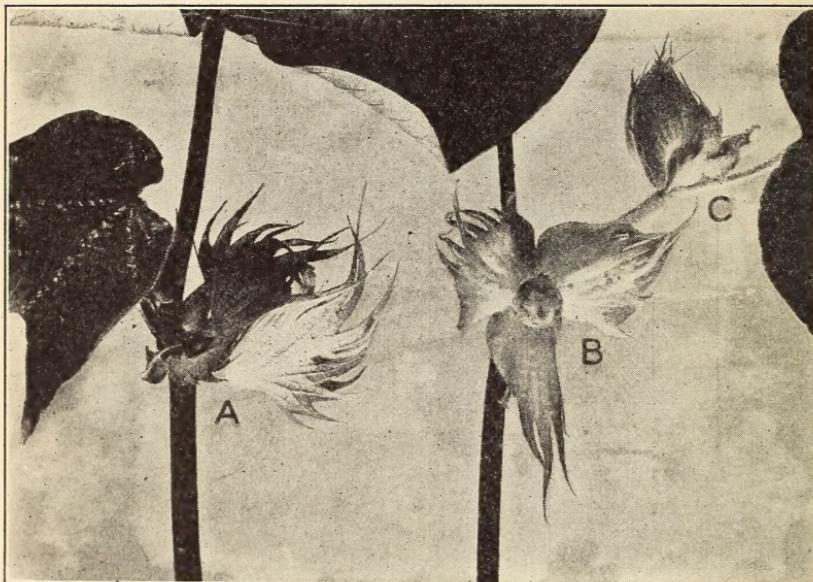


FIG. 4.—This shows how the three outside leaves, or bracts, flare out when the inside of the flower bud, or square, has been eaten away by the boll-weevil grub. A and C are healthy flower buds. B is a flared bud which has been eaten out by a weevil grub. About two-thirds natural size

place to put them. If it is late enough in the season for the plant to have bolls, she will lay her eggs in these.

A boll, you understand, is the fruit of the plant and is what the flower bud grows into. The boll is not a fruit such as man can eat. This word "fruit" is hard to understand sometimes because we use it in two different ways. Some speak of fruit as that part of a plant that one can eat. A botanist—that is, a man who studies plants—calls the fruit that part of the plant that makes the seed. Many plants first form buds which grow into flowers and then these make seeds. A botanist calls this the fruit of the plant, regardless of whether we can eat it or not. Many plants, such as the ferns and mosses, do not make fruit in this way, but most of our common plants do.

After the flower buds on the cotton plant open into blossoms the bright, showy parts soon fade and drop off. What is left after the

flowers drop is a small, rounded, green object which grows larger and larger as the weeks go by. This is the cotton boll, and inside of it are growing the seeds covered with a white cotton fiber. If the boll is not injured by the weevils it will open later in the bright sunshine and the pure white cotton will be seen peeping out ready to be picked. When we pick out this cotton, the dark cottonseeds come along with it and have to be separated from the cotton before we can use it to make cloth and clothing.

Early in the season the female weevils do not usually place more than one egg in each flower bud, but late in the fall, when it is sometimes hard to find a bud or a boll without an egg in it, several eggs may be put in a single boll or bud. Because the females do not like bolls as well as buds, as places to lay their eggs, the bolls usually are not harmed by the weevils as long as there are plenty of fresh buds to be had.

Once a boll-weevil egg is placed in a flower bud, and the egg has hatched into a grub, that bud is doomed to die. It will never open into a beautiful flower to be followed by a boll of cotton, because the young grub will kill it by eating it up. You can see that if the weevils lay many eggs in your cotton crop, when fall comes and you go to gather your cotton you will not find much to gather. The fields that should be white with cotton will be a dreary waste, and you will not have the money to buy food and clothing that your cotton would have brought you if it had not been destroyed. Men who have studied the matter carefully tell us that the cotton-boll weevil destroys, on an average, over \$200,000,000 worth of cotton each year.

WHERE THE WEEVIL CAME FROM AND WHERE IT IS NOW

Thirty-five years ago the boll weevil was a stranger in our country. About the year 1892 the first weevils entered the United States from Mexico. They came into our country near Brownsville, Tex., and from what they have done since they came here we can certainly consider them as "undesirable foreigners."

But the first comers were hardly noticed. Scientists in the Department of Agriculture who study and know most about good and bad insects—entomologists we call them—realized then that these weevils would become bad citizens, yet none of the people of the South imagined that they would increase to such enormous numbers and spread all over the Cotton Belt. By 1894 they had covered a half dozen counties in southern Texas. Even then, outside of the counties where there were a good many weevils, the people were not much alarmed. Cotton growers living in other States and even in other parts of Texas were quite sure that this new "cotton bug" was not going to bother them.

As soon as the weevils were settled in their new home in Texas they began to spread to new territory. Nothing seemed to stop them as they advanced across the Cotton Belt. In 1923, some 29 years later, they had reached the farthest northern cotton fields of Virginia. Figure 5 shows the spread of this weevil, year by year up to 1922. During this time the weevils advanced from 40 to 160 miles each year.

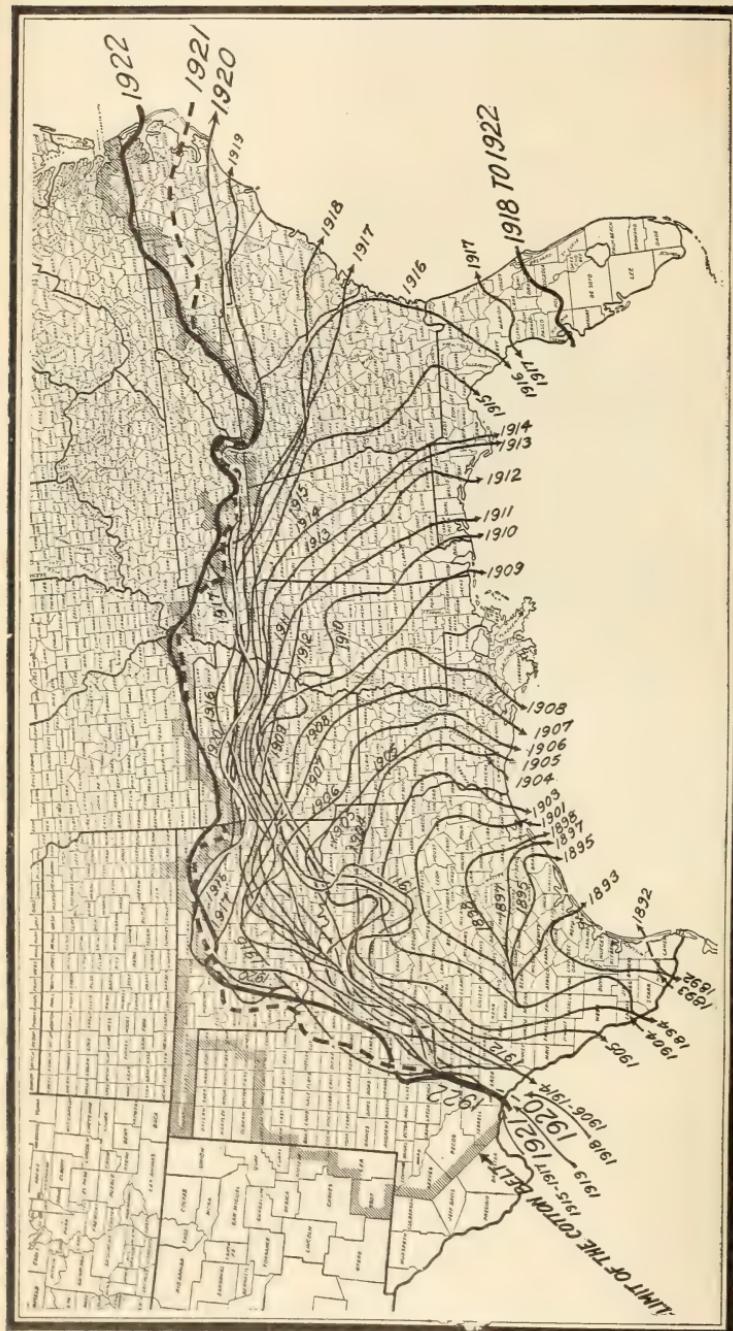


FIG. 5.—From about 1892, when the first boll weevils entered the United States from Mexico, until 1922, the weevil advanced from 40 to 160 miles each year. Now they can be found in nine-tenths of our cotton-growing area. This map shows the spread year by year, up to 1922.

There is a certain period in the summer, usually about the middle of August, when the weevils become restless and seem to have an instinct to fly away. They seem to want to leave the cotton fields where they have been living and go to other fields where they can live more easily. As long as there are fields of cotton free from weevils anywhere near by, the weevils are sure to fly in that direction.

The only thing that will stop the progress of the weevils across the country is a lack of fresh cotton fields or a very dry climate. Weevils do not breed fast when it is dry and hot and do very little damage at that time; they need a warm, moist climate. Thus in eastern Texas, where the summers are cooler and more moist, they infest all of the cotton territory, but in western Texas they have done very little damage because there the summers are very hot and very dry. The boll weevil can be found to-day in nearly every part of our cotton-producing area; it is also found in Mexico, Central America, and Cuba.

HOW TO CONTROL THE WEEVIL SO AS TO PROTECT OUR COTTON

We know now that the cotton-boll weevil is thoroughly bad and that it does an immense amount of damage to our cotton. There can be no question about this. Now, what is the best and easiest way to get rid of these weevils? How can we protect our cotton from these pests?

For the past 35 years many men have been trying to answer this question. A few of them have found out what we should do. Some of the wisest of these men have come to the conclusion that "we can not get rid of the boll weevil, but we can control it sufficiently to permit good crops of cotton to be raised." This is a help, even if we can not destroy every weevil there is. It is best to learn what they advise and to follow their directions if we possibly can.

When we come to study how we may get rid of the weevils, we find that nature helps us, although this help is not enough to destroy every weevil. It has been estimated that the possible children, grandchildren, great-grandchildren, and great-great-grandchildren of a single pair of weevils born in one season could amount to several million weevils if nothing happened to them. But something does happen to a great many of them. If this something did not happen to them in a natural way, and if every one of them grew it would be impossible for us to raise a bale of cotton in our country, no matter what we did personally.

Some kinds of climate will kill off the young weevils very fast. Often flower buds with the baby weevils in them fall to the ground and become so heated by the direct rays of the sun that the little creatures inside die in a short space of time. Too much dry heat is bad for the baby weevil, and this is the reason a cotton farmer likes a hot, dry summer; it gives his cotton a chance to grow.

There are certain insects whose young like to eat the soft weevil grubs. These tiny wasplike insects lay their eggs in the bodies of the boll-weevil grubs. The eggs hatch into very small grubs which feed on the boll weevils and kill them. Sometimes as many as half of the baby boll weevils in a cotton field are killed in this way, while in other fields very few or none seem to be killed.

Then there are other insects that cut their way into the infested flower buds and eat up the soft-bodied little creatures found there.

The most important of these insects that eat the boll weevil are certain kinds of ants. These ants seek out the infested buds while they are still hanging on the cotton plants. When such a bud is found, the ant promptly gnaws through the flower-bud wall and feasts upon the juicy grub inside. Often a very large part of the boll-weevil grubs and pupæ in a cotton field are destroyed in this way.

The most effective way, however, that nature helps man to control the boll weevil is by means of heat and cold. Very hot weather and very cold weather are even more distressing to a weevil than they are to us. A very cold winter followed by a bright, hot summer will generally stop the weevils from increasing to numbers large enough to do serious damage to our cotton crop. On the other hand, if the winter is mild and the summer is wet and cloudy, we may expect large numbers of weevils and much damage.

HOW TO FIGHT WEEVILS WITH POISON

It is not well for us to depend upon nature to do all the controlling, because we never can tell exactly what the weather will be during the cotton-growing season. It is too uncertain to depend upon temperature and dryness, and so we have tried hard to find something that would help us to protect our cotton. In all the years since the people of the Cotton Belt began to realize how much damage the weevil could do, we have tried to find some way of killing the boll weevil. Every kind of machine or poison that could be thought of has been tried, but without any great success until a few years ago. Finally, agents of the Louisiana Crop Pest Commission in 1908-9 tried lead arsenate in dust form with very promising results. However, no general or widespread use of this insecticide for boll-weevil control followed.

In 1914 field agents of the Bureau of Entomology, a division of the United States Department of Agriculture, which studies insects, began experimenting with a white, powdery poison known as calcium arsenate or arsenate of lime. This they dusted evenly on the cotton plants during the early morning while dew was still on the leaves and buds. Now full-grown weevils, besides feeding on the cotton plants, drink the dew that settles there. When the weevils came to feed and to drink after the plants had been dusted, each one of them swallowed a tiny portion of the poison and died.

This encouraged the field agents in their work, and a few days later they dusted the plants again. After this they found that more weevils had died, and so they felt they were on the right track in destroying the weevils. A third dusting was finally given, and then it was found that there were many more blooms in the field than when dusting was started. This meant to the agents that the weevils were being killed off faster than they could damage the new blooms by laying eggs in the flower buds.

The agents felt then that they had at last found something that would protect the cotton from too great a damage. They thought that if the weevils did not become too numerous later a good crop of cotton would be produced. So their field was carefully watched throughout the summer, and whenever the weevils appeared to be getting thick again another dusting of the calcium arsenate was given to it. When fall came there was a good crop of cotton in

the field that had been dusted, while in a field across the road which had not been dusted there was hardly any cotton.

For several years after this first experiment Government workers tested this way of controlling the weevil to be sure that they were right and to find out the best and least costly way of using the poison. Many cotton planters were afraid at first that the expense would be too much for them and they feared that it would not pay to poison their cotton. It was some time before these farmers could be convinced, but we know now that it will pay to use the poison if the weevils are seriously hurting the crop and if the land on which the cotton is growing is rich enough to produce one-third of a bale to the acre when there is no boll-weevil damage. We also



FIG. 6.—The hand dust gun is the smallest kind of machine for dusting cotton plants with calcium arsenate to kill boll weevils. The man who uses it turns a crank which causes a fan to blow the poison dust out of the long nozzle sticking out of the front

have learned that if the cotton farmer will see that the poison is put on the plants at the right time and in the right way, a good crop will follow.

Poison can not be put on the plants in the right way without proper dusting machines which are specially built for this work. There are several kinds of dusting machines on the market, and perhaps you have seen and used some of them. The hand dust gun (fig. 6) is the smallest kind of dusting machine. As you will see by looking at the picture, the man who uses it walks between the cotton rows and turns a crank on the machine which causes a fan on the inside to blow the poison dust out of the long nozzle sticking out of the front. The man who works the machine must keep the end of the nozzle pointed toward the cotton row while he turns the crank so that the poison will be sure to go on the plants. Hand

dust guns cost from \$12 to \$20 each, and one gun can not be used to dust more than 8 acres of cotton in any one season. It is very hard work to operate one of these little machines all day long.

The 1-mule machine (fig. 7) is pulled by a mule or horse that walks between two rows of cotton. There are two nozzles sticking out behind this machine, as you can see in the picture, and the poison dust is blown through them onto two or three rows of cotton as the machine moves through the field. This machine costs from \$75 to \$125, and one machine can be used to dust as much as 60 acres of cotton each season. It will dust 15 to 20 acres in a single night.

The cart machine (fig. 8) has two wheels that straddle a row of cotton and is drawn by two mules or horses. It has three nozzles and will poison from 25 to 30 acres of cotton in a single night. One

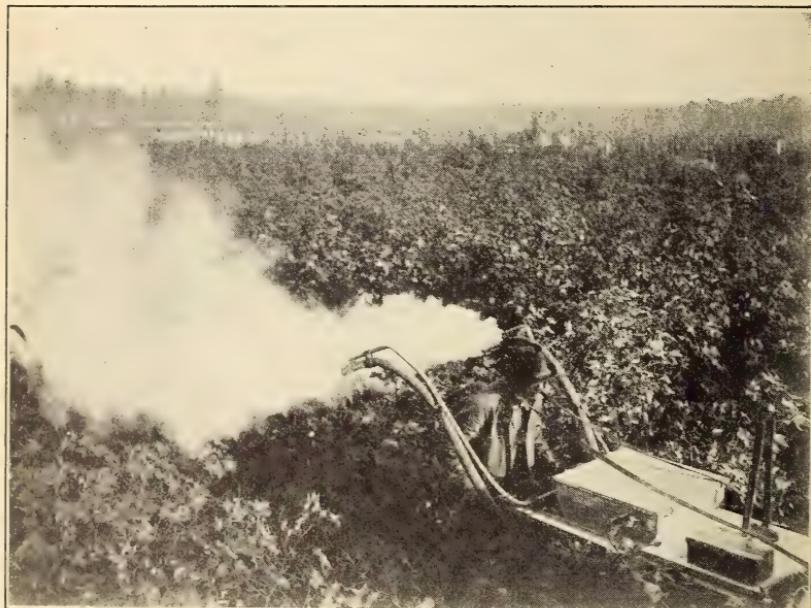


FIG. 7.—The 1-mule dusting machine is pulled by a mule or horse that walks between two rows of cotton. The poison dust is blown through two nozzles onto two or three rows of cotton as the machine moves through the field.

such machine can not be used to poison more than 100 acres of cotton through the season.

Within the last few years the airplane, too, has come to be used as a dusting machine. (Fig. 9.) Of course this does not mean that any airplane can be used for this work. The low flying that is done while dusting cotton is more dangerous than that done high up in the air. The plane has to be flown close to the ground, sometimes almost touching the cotton plants, and it can not be flown as fast as those high up in the air. Fortunately for those doing this kind of work there are specially built planes which can stay in the air while going much slower than can ordinary planes.



FIG. 8.—The cart dusting machine has two wheels that straddle a row of cotton, and it is drawn by two mules or horses



FIG. 9.—Within the last few years the airplane has come to be used as a dusting machine. Here we see an airplane applying poison dust to a field of cotton

The dusting planes must have special machinery for carrying and releasing the poison dust, too. There is a little door to the compartment holding the dust that can be opened when the airplane pilot is ready for dusting work. This opening can be regulated so as to let out just the quantity of calcium arsenate needed and then closed when no more is necessary. When the door is opened a stream of the poison dust falls through and is violently driven backward and downward by the current of air from the airplane propeller. Gradually the dust cloud spreads outward to each side of the plane and drifts in very fine particles to all parts of the cotton plants. (Fig. 9.) One airplane will dust as much cotton as 50 cart dusters.

Airplanes for cotton dusting are not owned by individual cotton planters, as is the case with the usual cotton-dusting machinery. They would be far too expensive for most cotton farmers to own. Instead they are owned by commercial companies who do the work for the planter at so much per acre. The charges for airplane dusting which the cotton planter has to pay amount to about the same as it would cost him to do his own dusting with horse-drawn machines.

A FEW RULES TO FOLLOW

There are a few simple rules that you should follow if you decide to use poison for the boll weevil. They are very easy to remember and not at all difficult to follow. You should learn them and follow them carefully if you want to save your cotton.

First you should get a supply of pure calcium arsenate in dust form and such dusting machinery as you will need. You should do this well in advance of the season when boll weevils are likely to injure the cotton. If you decide upon airplane dusting, you should make arrangements with one of the airplane-dusting companies during the winter before the dusting is to be done.

The next important thing to do is to look over your field soon after the plants have started to put on flower buds. After the flower buds or squares have appeared in the field you should examine some of them every day by breaking them open to see if they have weevil grubs (fig. 3, A) inside them.

If you find a good many infested squares, pick 100 squares and count the number that have grubs in them. If you find 10 or more infested out of the 100 squares, then it is time to begin poisoning. Before you start, however, you had better examine carefully all parts of the field, at least the four corners and the middle. Wherever you find 10 or more squares out of 100 infested, it would be well to dust that part of the field.

Perhaps you are wondering why you should wait until so many squares are infested before beginning to dust. It is because the cotton plant has the habit of putting out more squares than will ever open into blooms. A great many of these squares drop off without being injured at all. So it is easy to see that up to a certain point the squares which fall on account of boll-weevil injury are merely taking the places of the squares which would fall anyway.

When you decide to start the work of poisoning, remember that the machines should be run only when the air is calm and the cotton plants are moist with dew. With horse-drawn or hand-operated ma-

chines, this means at night. When the airplane is used, the dusting is usually done as much as possible during the very early morning hours.

Always remember that calcium arsenate is a poison and must be handled very carefully. Wear gloves whenever you use the powder and never get any of it in your mouth.

About 5 pounds of the poison should be dusted on each acre of the cotton at any one time. The plants should have their second dusting at the end of four days unless it rains, and then the plants should be redusted just as soon as the rain stops. Usually about three dustings will be enough to bring the weevils under control. If the weevils should get numerous enough later in the season to injure the cotton, you can dust once or twice more. A heavy rainfall within 24 hours after dusting will wash the poison off the plants; in such a case the field should be dusted again immediately.

OTHER WAYS OF DESTROYING WEEVILS AND HELPING THE COTTON PLANTS TO GROW A GOOD CROP

We should not depend upon the poison alone, however, to protect our cotton crop from the boll weevil. Sometimes it is not necessary to go to the expense of poisoning the weevils. Other means of control may be enough to protect the crop.

One of the most important control methods we can use is the destruction of the cotton plants in the early fall. You know that in the fall there are likely to be great numbers of baby boll weevils in the squares and bolls which are still on the plants at this time. If these are left in the fields the baby weevils will grow into adults and then go into their winter sleep. Those that live through the winter will attack the young cotton plants next spring. To prevent this, we should burn or completely plow under all the cotton plants standing after the crop is gathered. If we do this we shall destroy all the weevil grubs and pupae before they are able to grow any more. In order to get the best results we should do this before the first killing frost.

As the weevils use any kind of grass or weeds for shelter, it would be a good thing to clean up along fence rows, all the ditches on the farm, and around the edges of our cotton fields. If we do this thoroughly, the weevils will have no place to spend the winter and will then be killed by the cold.

If we can not clean up before frost time, it is often a good thing to pasture our fields with livestock, letting the animals eat as much of the plants as they will. This is perfectly safe for stock, even if poison has been used earlier in the season. Not enough poison will stay on the plants to hurt the grazing animals.

Now we come to the two most important points in raising a cotton crop in those parts of the country where the boll weevils are. Always select cotton seed of a kind that will grow and produce ripe cotton as quickly as possible, then plant this seed as early in the spring as possible after all danger from frost is past. If we can use a kind of cotton that will grow and ripen quickly and if we can start it to growing early enough in the spring, you can easily see that there will be a chance for the crop to ripen, or at least a part of it, before the boll weevils get numerous enough to do serious

damage. In other words, it is to be a race between the cotton plants and the weevils, and this is always interesting. As in all races, an early start carries with it a great advantage to the runner.

There are other things that you will need to think about in growing and protecting your cotton. Among these are the preparation of the seed bed, the use of fertilizers, and the careful cultivation of the crop. The land should be plowed during the fall and winter and thoroughly prepared for the seed bed, so that you will have no delay in early planting. The proper use of the right commercial fertilizers will give you larger yields and help your crop to ripen faster.



FIG. 10.—When fall came there was a good crop of cotton in the fields that had been properly dusted with calcium arsenate to kill the boll weevils

Careful cultivation during the growing season is necessary, too, if you want a good crop to grow. The plow should not be run too deep or too close to the plants, as this will cut off some of the roots and make the flower buds drop off. When boll weevils are being fought you must avoid this. It is a good thing for you to keep on cultivating until late in the season. This causes the plants to keep on forming flower buds, and these new buds will attract the weevils and stop them from laying eggs in the bolls that are still on the plants. If we can have plenty of bolls we are fairly sure to get a good cotton crop. (Fig. 10.)

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